MAHESH KUMAAR BALAJI

MACHINE LEARNING

HOMEWORK - 1

$$A = \begin{bmatrix} 3 & 1 & 5 \\ 6 & 2 & 0 \end{bmatrix}_{2\times 3} \quad B = \begin{bmatrix} 6 \\ 4 \\ -1 \end{bmatrix}_{3\times 1} \quad C = \begin{bmatrix} 2 & 4 \\ 3 & 6 \\ -1 & 2 \end{bmatrix}_{3\times 2}$$

$$D = \begin{bmatrix} 5 & 2 \\ 3 & 1 \end{bmatrix}_{2\times 2} \quad E = \begin{bmatrix} 3 & -2 \\ 1 & 4 \end{bmatrix}_{2\times 2} \quad F = \begin{bmatrix} 2 & 1 & 3 \\ 5 & 7 & -2 \end{bmatrix}_{2\times 3}$$

1) A + F

Order of both matrices A & F are 2 × 3

$$\therefore A + F = \begin{bmatrix} 3+2 & 1+1 & 5+3 \\ 6+5 & 2+7 & 0-2 \end{bmatrix}_{2\times 3} = \begin{bmatrix} 5 & 2 & 8 \\ 11 & 9 & -2 \end{bmatrix}_{2\times 3}$$

2) E − D

Both E & D have the same order i.e. 2×2

$$\therefore E - D = \begin{bmatrix} 3-5 & -2-2 \\ 1-3 & 4-1 \end{bmatrix}_{2\times 2} = \begin{bmatrix} -2 & -4 \\ -2 & 3 \end{bmatrix}_{2\times 2}$$

3) C + B

Order of matrix C is 3×2 while order of matrix B is 3×1. Since they are not the same, C + B is not a valid matrix operation.

4) $C(D)$

Order of $C = 3\times2$

Order of $D = 2\times2$

Since number of columns of C is equal to number of rows of D,

C.D is a valid operation.

Order of the product matrix will be 3×2.

$$C(D) = \begin{bmatrix} 2 & 4 \\ 3 & 6 \\ -1 & 2 \end{bmatrix}_{3\times2} \begin{bmatrix} 5 & 2 \\ 3 & 1 \end{bmatrix}_{2\times2}$$

$$= \begin{bmatrix} 22 & 8 \\ 33 & 12 \\ 1 & 0 \end{bmatrix}_{3\times2}$$

5) $A.(F)$

Order of $A = 2\times3$

Order of $F = 2\times3$

number of columns of A $\neq$ Number of rows of F

∴ So, A.(F) is invalid matrix operation.

6) $C^T = \begin{bmatrix} 2 & 4 \\ 3 & 6 \\ -1 & 2 \end{bmatrix}^T_{3\times 2}$

$= \begin{bmatrix} 2 & 3 & -1 \\ 4 & 6 & 2 \end{bmatrix}_{2\times 3}$

7) $F^T(E)$

$F^T = \begin{bmatrix} 2 & 1 & 3 \\ 5 & 7 & -2 \end{bmatrix}_{2\times 3} = \begin{bmatrix} 2 & 5 \\ 1 & 7 \\ 3 & -2 \end{bmatrix}_{3\times 2}$

$E = \begin{bmatrix} 3 & -2 \\ 1 & 4 \end{bmatrix}_{2\times 2}$

No. of columns of F^T = No. of rows of E

$\therefore F^T(E) = \begin{bmatrix} 2 & 5 \\ 1 & 7 \\ 3 & -2 \end{bmatrix} \begin{bmatrix} 3 & -2 \\ 1 & 4 \end{bmatrix}$

$= \begin{bmatrix} 11 & 16 \\ 10 & 26 \\ 7 & -14 \end{bmatrix}_{3\times 2}$